The same message reports that these observers find remarkable changes in the spectrum of Mira Ceti, the bright helium and hydrogen lines being strengthened and widened towards the red.

TIDES IN PIPES.—In 1914 Messrs. A. A. Michelson and H. G. Gale made a preliminary investigation of the tidal changes in water-level in two pipes, each 502 ft. long, placed respectively along a meridian and a parallel, in the grounds of the Yerkes Observatory. They have now made a more refined series of observations (described in the *Astrophysical Journal* for December). The small changes of water-level are registered by photographing interference fringes produced by placing a mirror about $\frac{1}{2}$ mm. below the surface of the water, and passing a beam of light from an electric lamp vertically down through the water-film, then reflecting it on emergence into a camera in which a sensitive film is moved by clockwork at the rate of 2 cm./hour. Some of the photographed curves are reproduced, and show a beautiful accord with the theoretical curves, which were carefully calculated by Prof. F. R. Moulton. The transition from spring to neap tides, and even the difference in height of alternate semi-diurnal tides, are obvious at a glance. The result shows that the pipe tides are 0·690 of what they would be on a rigid earth, so that the bodily tides in the earth's crust are 0·310 of what they would be if the earth were fluid. The earth tides appear to lag behind the impressed forces by 4°. This method avoids many of the complications that are present in the observation of ocean tides; it also appears to be capable of greater relative precision, in spite of the smallness of the quantities involved.

There appears to be a slip in the value of the rotational velocity ω (p. 350); it is printed as 2π sidl. day/solar day, but surely it should be 2π solar day/sidl day, the mean solar day being the unit of time employed.

LUMINOSITY IN CENTIPEDES.[1]

AS Chilopoda have been traced back to the Carboniferous age by the palæontologists, these centipedes may be presumed to have understood their own interests pretty well in the struggle for existence. *Geophilus electricus* (Linn.) had already won the attention of Aldrovandi in the sixteenth century, and the specific name adopted for it by Linnæus was obviously based on its observed luminosity. The notes now under review state that among the centipedes only one great group, the Geophilimorpha, is known to exhibit the phenomenon.

With so long a history for the group in the modern period, it seems strange that biologists should still need to ask in regard to some of its species, which are by no means uncommon: Why are they luminous? Even those keen observers, Mr. and Mrs. Brade-Birks, after minute examination, with the aid of friends, and critical comparison of recent authorities, leave the subject inconclusively concluded. Microscopists will read with pleasure details of the contrivances by which they persuaded their many-legged, wriggling subjects, under just the friendliest squeeze, to sit for their portraits. As definite result of their careful study of *Geophilus carpophagus,* they "conclude that in the excretion which accompanies luminosity there are generally present: (i) the contents of the white glands, for [which they] propose the name of *protoluciferin,* (ii) mucin, (iii) acid." The expression "white glands" seems to be used rather vaguely, as applying to certain white, rounded masses on the ventral parts of the specimen, these masses being "groups of pyriform, and probably unicellular, glands intimately associated with the production of light." But it is not made clear whether whiteness is a property of individual glands or only an effect of their grouping into opaque masses.

For an understanding of the debate on the value of lighting up as displayed in this very limited section of the animal world, Dr. Shipley's brief notice may usefully be quoted. He says:—"Some members of the family Geophilidæ are phosphorescent, and secrete from certain glands on the ventral surface a luminous slime; since this is produced by both male and female, and neither of them has eyes, the secretion is regarded as a means of frightening or warding off enemies. The male Geophilus spins a web, and drops a spermatophore in the middle of it, and the female comes and fertilises herself" ("Zoology of the Invertebrata," p. 315). The present collaborators suggest that, without specialised organs of sight, the Geophilids "may be able to appreciate light by a general absorption of its waves through the surface of the body." Though this inchoate power of vision might be otherwise of service, it could scarcely help in bringing the two sexes together, and the riddle is complicated by the fact that allied species without luminosity seem to arrange their affairs very well in its absence.

In general, experience has shown that animals, other than beasts of prey, are not frightened, but attracted, from a dark environment by illumination, so that among the alternative services of *protoluciferin* suggested by the authors any scaring property may be set aside as very improbable.

The systematist is now warned by our authors that *Stigmatogaster subterraneus* should be attributed to Shaw. So lately as last December, in Nevin Foster's list of fifty-three Irish Myriapods, they sanctioned the long-standing error of assigning the species to Leach. They acknowledge themselves baffled by the specific name of *Geophilus convolvens,* on which Fabre founded his researches. This is said to be not a phosphorescent species. Otherwise one might have supposed the name evolved from the strange account which Lucas cites out of the *C.R. Acad. médicale des sciences de Metz* in 1830. This records the frightful tortures in the head of a young Frenchwoman, which after a year were suddenly terminated "par l'expulsion d'un insecte qui, jeté sur le plancher, s'agitoit avec rapidité et se rouloit en spirale." It, however, was determined to be a specimen of *Geophilus carpophagus,* Leach. Gistel in 1850, writing of the Feuerwurm *Geophilus electricus* alludes to the story, but does not, in fact, discredit it by remarking that such a species could not penetrate the frontal cavities of a human head unless the owner of the head were asleep.

T. R. R. S.

THE POSITION OF THE METEOROLOGICAL OFFICE.

AT the monthly meeting of the Royal Meteorological Society, held on February 18, Capt. C. J. P. Cave brought forward a paper on "The Status of a Meteorological Office and its Relation to the State and to the Public." It was pointed out that a Meteorological Office is a practical necessity, and, since to be at all efficient it must be subsidised from public funds, it has to be under some Government Department. The work of a Meteorological Office is, however, very wide, and concerns, not one, but almost every Government Department; and if it is to be under one without adequate safeguards, there

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[1] Dartford Naturalists' Field Club Occasional Papers. Notes on Myriapoda. XX. "Luminous Chilopoda, with Special Reference to *Geophilus carpophagus,* Leach." By Hilda K. Brade-Birks and the Rev. S. Graham-Birks.

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is a great danger that many important sides of meteorology will be neglected. Safeguards are that the Director of the Meteorological Office should be directly under the Minister of the Department concerned, and on no account under other permanent officials, and that the Meteorological Office should have its separate vote and account in the Estimates. Hitherto the expenses have been controlled by the Meteorological Committee, a body on which several Government Departments as well as the Royal Society are represented; there seems to be no reason why this arrangement should not be continued. The work of the Meteorological Office concerns not only Government Departments, but also such bodies as county councils, municipal bodies, organisers of engineering undertakings, and the general public; and probably none of these know how great a use may be made of meteorological information.

The public is chiefly concerned with forecasts, and probably the mistrust of forecasts which undoubtedly exists in the public mind is due to the delay that occurs before the forecasts are available. Those that appear in the daily papers are based on observations at 6 p.m. of the previous day, but if forecasts based on the 1 a.m. or 7 a.m. observations were sent to every telegraph office in the country and posted up, and could be obtained by telephone subscribers, it would probably prove a great boon, especially to agriculturists, and do much to dispel the present mistrust of weather forecasts.

During the past year the Meteorological Office forecasts have been issued from the Air Ministry, and in the Air Estimate there appears a sum for the Meteorological Office. From this it appears as though the Office is to pass under the Air Ministry. In former times when any change was made in the status of the Office an official inquiry was held, but no such inquiry has apparently taken place as a prelude to the present change, and no public announcement of any kind has been made. There seems no reason for the change. The Meteorological Office had done work on the upper air long before the war, and it was its work which proved that long-distance night flying was a practical possibility. Meteorology must be a national Service, but the policy of handing it over to one Ministry without a separate vote and account would be disastrous, not only to meteorology as a science, but also to the State at large.

The following resolution was adopted at the meeting:—"The Royal Meteorological Society observes that in the Air Estimates for 1919–20 published last December there appears a sum of 12,000*l.* as a supplement to the grant in aid of the Meteorological Office. It would appear from this that it is intended that the finances of the Meteorological Office shall pass under the control of the Air Ministry.

"The Meteorological Office deals with a variety of problems of high scientific and practical importance, some of which have no bearings on the work of the Air Ministry, but are closely connected with the work of other Government Departments. While recognising to the full the great benefits to the meteorology of the upper air likely to accrue from a close association with the Service to which a knowledge of the upper air is so essential, and which possesses such facilities for its investigation, this society cannot but feel misgiving that there may be a tendency for other branches of meteorology to receive less than their due attention if one Government Department has the sole control of the finances and management. The society, therefore, is of opinion that the Meteorological Committee should continue to have full control of the expenditure.

"It has been the practice in the past, before any change was made in the body administering the Meteorological Office, for an inquiry to be held by a Departmental Committee. Reports of three such inquiries have been published, the last being that issued in 1904 of a Treasury Committee presided over by Sir Herbert Maxwell, Bart. The Treasury did not adopt the whole of the recommendations of this Committee, but on May 20, 1905, it issued a minute constituting the Meteorological Committee as it has since existed. The society is of the opinion that before the future constitution of the Meteorological Committee and the status of the Meteorological Office are finally settled, it is desirable that an inquiry by a representative committee should be held."

PRE-HISTORY OF MAN IN BRITAIN.

FLINT IMPLEMENTS FROM THE CHALKY BOULDER CLAY OF SUFFOLK.

MR. J. REID MOIR described to the Royal Anthropological Institute on February 17 some interesting flint implements and flakes found in two pits situated to the north of Ipswich, and in a pit at Claydon, to the north-west of that town. In each of these pits Boulder Clay of considerable thickness is exposed, and this deposit, in the opinion of Prof. J. E. Marr, who has visited the sections, is *in situ*, and represents part of the large sheet of Boulder Clay of the Ipswich district. Mr. Reid Moir found many of the specimens described *in situ* in the Boulder Clay, and the others, handed to him by workmen employed in the pits, are of such an order as to make it certain that these implements were also derived from the Boulder Clay. The specimens are in nearly every case made from flakes, and exhibit very little change of surface or signs of abrasion. The two principal types are *râcloirs* and *pointes*; primitive flake-implements and large scrapers are also represented in the series. The technique of these artefacts is in many ways comparable with that of Early Mousterian times, and it is probable that these Boulder Clay specimens are referable to this cultural phase. The implements appear to have been lying in or upon a land surface before being incorporated with the morainic material in which they are now found. One well-made and deeply ochreous flake found in the Boulder Clay appears to be of Chellean age. It exhibits reflaking along its edges, and this flaking is patinated in the peculiar manner of some of the Boulder Clay artefacts.

In the discussion which followed the reading of the paper all the speakers united in dwelling upon the importance of the contribution made by Mr. Reid Moir to the study of the pre-history of man in Britain. Prof. Arthur Keith pointed out that the conclusions which followed from the results of Mr. Reid Moir's investigations could only be described as revolutionary, and would involve a reconsideration of the evidence relating to the antiquity of Stone-age implements. Mr. Reginald Smith said that the *pointe* was considered to be the typical implement of the Mousterian stage of culture. Archæologists would have to consider the possibility of its occurrence in other periods. The peculiar patination which occurred on certain of the specimens found by Mr. Reid Moir in the Ipswich Boulder Clay occurred at Northfleet, and was usually considered to be typical of the Le Moustier period. Mr. Smith also pointed out that some thirty-five years ago Dr. Skertchley had raised the question of the occurrence of palæolithic implements below the Boulder Clay. Dr. Barnes remarked that a considerable number of flakes must be examined before it can be concluded

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